

February 6, 2009

HW and GRE Response to Technical Review Comments

1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.

Reviewer 1A (Rating: 4)

The objectives are generally a good fit with the REC. This will effectively boost the transportation fuel output of the plant and the competitiveness of that facility. Of course, the project would be even stronger if the conversion of the oil to biodiesel were to take place in North Dakota. If Blue Flint Ethanol is already capturing waste heat from a coal-fired power plant, then the reported energy savings may be overstated.

Reviewer 1B (Rating: 3)

The PIs proposed to utilize corn ethanol co-product to produce biodiesel. It is very clear and consistent with ND goals. However, “creating a renewable energy market for corn oil” is not clear because the impact of this project on the biodiesel market will be small. The PIs should have mentioned in the proposal how much crude corn oil will be obtained from corn ethanol plants in ND, what the quality of the oil will be for biodiesel production, and how much biodiesel is produced in ND etc. Also, “protecting ND renewable energy jobs” is not very clear because again, the impact of created jobs from the proposed project is very limited and not elucidated in the proposal.

PI Response

We view this project as the first step in the process of developing a viable biodiesel industry in ND. Several alternatives for biodiesel production are being evaluated which are outside the scope of the proposed project and thus excluded from the grant application. Some of these alternatives include:

- Building an onsite biodiesel production unit to process the corn oil.
- Working with other ethanol plants interested in extracting corn oil from their process to aggregate corn oil supply to create a biodiesel plant in ND.
- Working with other sources of oil and fat production to aggregate supplies to create a biodiesel facility.

Building the biodiesel industry in ND was considered by the applicants as an objective for this project, however it is unclear as to which, if any of these alternatives will be pursued and how to quantify this objective. We believe that the project has merit with respect to growing renewable fuels production by providing a precursor – corn oil. Therefore, while increased biodiesel production in ND is a long term goal, it is not stipulated as an objective of this specific project.

It is estimated that 1.5 million gallons of crude corn oil can be captured at the Blue Flint facility. Blue Flint is a 50 million gallon per year production facility. In addition to Blue Flint there is one additional 50 million gallon plant in ND and two 100 million gallon plants in ND, along with some smaller facilities. Therefore, ND is currently capable of producing about 9 million gallons

of crude corn oil from ethanol plants. However, the project is not aware of business plans for facilities other than Blue Flint and therefore did not include this information in the grant application.

Blue Flint Ethanol directly employs 37 people. Revenue diversification from this project will help ensure the financial stability of this facility and therefore protect these existing renewable energy jobs. Proving the viability of this technology may provoke the additional facilities noted above to perform similar projects thus protecting additional jobs.

2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.

Reviewer 1A (Rating: 4)

The proposal has very good documentation in this area. The technology has already been demonstrated and is likely already in use at several other ethanol plants in the US.

Reviewer 1B (Rating: 3)

I am not convinced that 1) the quality of corn oil extracted is good enough for biodiesel production without further purification; 2) the process is energy-balance-positive since heating will be used; 3) the value of corn DDGS will be the same if oil is extracted; 4) it is cost effective. How much revenue will be generated vs. cost? I believe the PIs can build the system with the budget available in 5 months, however, if my concerns above are not addressed, it is not likely that the project will sustain, and so the objectives will not be achieved. I was looking for small-scale or even lab-scale tests to show the technical/economic feasibility of the project.

PI Response

1) We see little risk in product quality. The technological feasibility has been thoroughly demonstrated at other facilities outside ND. The grant application was not meant to advocate any particular technology providers system and therefore did not include this information. However, all suppliers in consideration utilize proven technology and guarantee oil quality suitable for biodiesel production.

2) The process energy balance concern is a valid and reasonable question. The answer is variable depending on the chosen technology. Some technologies require heat and thus heat exchangers before the centrifuge. Other technologies run directly to the centrifuge from the evaporators requiring no supplemental heat. Energy requirements will be taken into account when selecting a technology provider. It is also important to note that Blue Flint has uniquely low heating costs due to the utilization of power plant waste steam for energy.

3) The project has carefully considered the risk of devaluing distillers grains products by extracting the corn oil. Lab results indicate the only nutrient significantly impacted in the oil removal is fat content. The value of fat content is dependent upon the market into which the distillers product is sold. In general, poultry and beef cattle in northern climates require higher

fat content. While research indicates that swine and dairy cattle distillers rations can be increased by removing the fat.

The project intends remove corn oil to a point that fat reduction in distillers products will drop about 30%. This is less aggressive than current technology allows. Modeling has shown that at this level, distillers grains will not be significantly devalued and the oil extraction will achieve the volume and economics described in the grant application.

4) Cost effectiveness of the proposed project has received close scrutiny since the project was first conceived. It is difficult to ensure the profitability of manufacturing a 'commoditized product' because market forces have significant impact on its sales price. However, the special grant hearing request for this project was made in part to limit market risk. The business plan focused on opportunities to lock in prices during favorable economic periods via off take agreements with biodiesel producers.

We believe this project is viable and self sustaining, plus it provides product economic diversity which benefits the project sponsors for the long term. The model, in its current form, generates positive net income and positive cash flows. The gross margin averages 32% of sales while the net income ratio averages 14%. The project also produces positive cash flows in the first year.

5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 1A (Rating: 3)

The proposal did not include much of a review here; however, the technical feasibility is not questioned.

Reviewer 1B (Rating: 2)

The PIs should have explained why there is currently no business in ND that is producing corn oil for biodiesel production. One important reason might be the cost. The PIs should have also mentioned and compared current technologies for oil extraction to prove that the proposed one is the best.

PI Response

This technology has not been employed in ND because facilities in the ethanol industry which can accommodate this type of technology are relatively new. All four of the facilities indicated earlier started production in 2007 or later. Progressive facilities such as Blue Flint recognize that their corn feedstock must be utilized to produce as many co-products to ethanol as financially viable. The application indicated total project costs of around \$2 million. From the applicants perspective the project is economically viable at a construction cost of \$1.5 million given the current market conditions.

There are two reasonable alternatives that can also produce corn oil from the ethanol production process. Fractionation removes the components of a corn kernel containing oil at the early stages of processing. This technology is viable but requires major renovation to the facility and dramatic changes the ethanol production process.

The second alternative is pressing or squeezing the DDGS to remove oil. This process was not deemed a cost effective alternative to remove corn oil.

Currently, using a centrifuge is the most cost effective way to remove corn oil in an ethanol facility. All proposed technology suppliers are using either a horizontal or vertical centrifuge to remove the oil from the syrup, with subtle differences in technique and quantity removed.

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 1A (Rating: 3)

Good documentation. The partners in this project are suitable.

Reviewer 1B (Rating: 2)

There is no milestone chart, timetable, financial plan or communication plan for this project.

PI Response

There will be slight variability in the timetable and milestones depending upon the technology provider selected. The grant application Attachment A provides an example of the expected timetable. The addendum to the original grant application delineates the job plan used for capital projects. Project communication is one portion of the overall job plan.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 1A (Rating: 3)

Comments are similar to #1 above.

Reviewer 1B (Rating: 2)

The PIs should have included a quote/bid/specification for the centrifuge and other extraction equipment to be used in this project.

PI Response

The PI has not yet selected a technology provider for the project. Comprehensive bids received range from \$1.8 million to \$2.5 million. If the grant is awarded, confidential detailed quotes can be shared with the NDIC for the selected technology provider.